

Claims

1. A communications method for carrying out communications using a plurality of M signal points to be placed on an I-Q plane, characterized in that

when the M signal points are spaced on the I-Q plane around a point of origin to have a uniform space a in directions of an I-axis and a Q-axis, inside of a circle or inside of the circle covering over the circle having a radius of a space b between the point of origin and a point of the largest value in both directions of the I-axis and the Q-axis, the M signal points are placed in such a manner that a space between any two arbitrary signal points is equal to or larger than the uniform space a , and a space between at least a pair of signal points is larger than the uniform space a .

2. The communications method according to claim 1, characterized in that

the M signal points are placed over a plurality of circles on the I-Q plane around the point of origin, a radius of the respective circles is an integral multiple of a radius of the smallest circle, and the radius of the largest circle is the space b .

3. The communications method according to claim 2, characterized in that

on the respective circles, the signal points of the integral multiple of 4 are spaced uniformly to be symmetric

to the I-axis and the Q-axis.

4. A communications method for converting a signal point of a received signal into data corresponding to any of a plurality of M signal points to be placed on an I-Q plane, characterized in that

a determination is made for a level of the signal point of the received signal, and another determination is made for a phase of the signal point of the received signal on the I-Q plane, and the signal point of the received signal is converted into data equivalent to a value based on determination results.

5. A communications system for carrying out signal communications from a communications device at a transmission end to a communications device at a reception end using a plurality of M signal points to be placed on an I-Q plane, characterized in that

the communications device at the transmission end comprises: signal point conversion means for converting transmitting data into a signal point using a placement of signal points in which, when the M signal points are spaced on the I-Q plane around a point of origin to have a uniform space a in directions of an I-axis and a Q-axis, inside of a circle or inside of the circle covering over the circle having a radius of a space b between the point of origin and a point of the largest value in both directions of the I-axis and the Q-axis, the M signal points are placed in such a manner that a space

between any two arbitrary signal points is equal to or larger than the uniform space a , and a space between at least a pair of signal points is larger than the uniform space a ; and

signal transmission means for transmitting a signal structured by the signal point as a result of conversion by the signal point conversion means, and

the communications device at the reception end comprises:
signal reception means for signal reception;

signal point position determination means for making a determination for a position of the signal point of the received signal on the I-Q plane; and

data conversion means for converting the signal point of the received signal into data corresponding to a signal point to be identified based on a determination result by the signal point determination means.